UNIVERSITI TEKNOLOGI MARA

ESTABLISHING HALF SATURATION CONSTANT FOR NITRATE IN BULK WATER UNDER ANOXIC CONDITIONS

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ABSTRACT

The sewer is an integral part of the urban wastewater system: the sewer, the wastewater treatment plant and the local receiving waters. The sewer is a reactor for microbial changes of the wastewater during transportation, affecting the quality of the wastewater and thereby the successive treatment processes or receiving water impacts during combined sewer overflows.

This project presents the results of studies on anoxic processes, namely denitrification, under sewer condition. Experiments were conducted on 5 samples taken from two locations, namely, the Wastewater Treatment Plant at Section 23, Shah Alam and UiTM Packaged Sewage Treatment Plant at Jln Ilmu, UiTM Shah Alam. Tests were performed using batch reactors to measure denitrification rate under conditions of excess electron donor and limited electron acceptor. Concentrations of electron acceptors in samples *i.e* nitrate and nitrite were determined using Metrohm Ion Chromatograph 790 COM.

Experiments conducted on wastewater sample have shown that the value of half saturation constant, K_{NO3} were found to be in the range of 0.3 –1.2 $gNO_3\text{-}N/m^3.h$.

CHAPTER 1

INTRODUCTION

1.0 GENERAL

Wastewater originating from municipalities, communities and runoff from precipitation on urban surfaces are typically collected and conveyed to treatment and disposal. The wastewater collection system is called a sewer network that consists of individual pipes, manholes and pumping stations. The sewer also acts as a reactor for microbial changes of the wastewater during transportation and therefore affects the wastewater quality arriving at the wastewater treatment plant (Hvitved-Jacobsen, T. 2001). Changes in wastewater quality may occur under aerobic, anoxic or anaerobic conditions. Understanding of the basic kinetics of the microbial processes is essential before a design procedure for sewers that incorporate microbial changes during transport can be proposed.

1.1 PROBLEM STATEMENT

The introduction of new, bigger and more efficient centralized treatment plants to replace the 7000 smaller WWTPs in Malaysia will increase the time taken for the wastewater to be transported from source to the wastewater treatment plant. The increase in time would cause significant changes in wastewater quality during transport.

A study on in-sewer processes is needed in order to enhance our understanding on wastewater quality changes during transport and to determine the rates and identify significant components in the denitrification pathway. This study will focus on the microbial changes occurring in the bulkwater phase under anoxic conditions.

1.2 OBJECTIVES

This project has an overall goal of providing a better understanding on the microbial processes occurring in sewers during transport of wastewater.

The objectives of this project are:

1. To establish the necessary apparatus and experimental procedure that is appropriate to determine half saturation constants for nitrate K_{NO3} in bulk water .
2. To verify denitrification path in wastewater.
3. To establish half saturation constant for nitrate under anoxic transformation in municipal wastewater.